secured by very different means in two plants of the same genus, and so very much alike in all other particulars.

Hobart, July 25. HENRY J. COLBOURN.

Electricity direct from Coal.

WITH reference to the announcement made in the *Daily Mail* of September 1, that Thomas A. Edison had completed a machine for the generation of electric power direct from coal without the use of engines or dynamos, may I ask you to reprint a few lines from an article on electric traction I wrote for you, and which you published on April 12, 1894?

"Before electric traction can be employed on a very large scale, we must possess a means of producing the electricity on the spot and at the time it has to be used, or, in other words, we must possess a battery in which the energy of coal can be transformed directly into electric current, so that we may do without storage batteries in which to carry electric energy about, or heavy copper conductors through which to convey it at moderately low tension from the spot where it is produced to where it is used, or light aërial conductors through which to convey it at high tension.

"How long we shall be without this, or how many minds are engaged in the solution of this or some such problem, we know not, but the moment it is solved, and solved doubtless it will be, there will be such a transformation scene in the industrial applications of electricity as one can hardly conceive. It would mean that for almost all purposes except those in which heating is required electricity would or could be used. An electric light-producing battery in every house, quite independently of any mains in the streets; an electric power-producing battery to carry us whither we would on rails or on the streets; and in every house to put an end to all the evils attendant on crowded factories and workshops, in crowded streets and towns; such and other advantages would result from turning electricity from a servant into a master, from a mere transformer of energy into a source of energy."

E. F. BAMBER.

48 St. James's Square, W., September 3.

Artificial Deformations of Heads, and some Customs connected with Polyandry.

WITH reference to your note on M. Charles de Ujfalvy's recent article in *l'Anthropologie* (p. 323, *ante*), I may be allowed to call your attention to the ancient Korean practice of artificially deforming their heads, which was apparently similar to the method adopted by the Huns as well as the Hûna kings of India. Thus, the Chinese "History of the Later Han Dynasty," written in the fifth century, *sub.* "Eastern Barbarians," says: "The people of Ma-Kan (in the south-western part of the Korean peninsula) wish their heads flat; so the head of every child just born they compress with stone to deform it."

The special horned head-dresses worn by the polyandric women of the White Huns put in mind the old Japanese usages, described by Fujioka and Hirade in their "History of the Japanese Customs and Manners," Tokio, 1897, vol. i. p. 169: "In the festival of the god of Tsukuma, every woman had to go in procession after the holy sedan-chair, with a number of pans on her head proportionate to her immoralities. In the temple of Usaka, while the priest was praying in a feast-day, every woman was scourged on similar principles."

KUMAGUSU MINAKATA.

1 Crescent Place, South Kensington, August 11.

Huxley and his Work.

ON p. 13 of "One Hundred and One Great Writers," issued by the *Standard*, and presumably edited by Dr. Garnett, occurs the following remarkable account of Huxley and his work. "Huxley's work is that of the populariser, *the man who makes few original contributions to science or thought*, but states the discoveries of others better than they could have stated them themselves." Comment is needless. F. W. HENKEL.

Markree Observatory, Collooney, Ireland, August 23.

THE CAUSES OF FRACTURE OF STEEL RAILS.

WHEN the down Scotch express was running through St. Neots station, on the Great Northern Railway, on December 10, 1895, a rail broke into seventeen pieces, part of the train left the metals, and a serious accident resulted. Several features of the report on the mishap, drawn up in the ordinary course by the late Sir Francis Marindin, might well have occasioned deep thought, notably the conclusion that the first fracture of the rail took place over a chair at a minute induced flaw, which did not exist when the rail was manufactured.

The whole report, however, is suggestive rather than explanatory, and the result was the appointment by the Board of Trade of a committee to investigate the question of the loss of strength of steel rails caused by prolonged use. The committee was a very strong one, and contained some distinguished steel manufacturers, engineers, metallurgists and chemists. They collected a vast amount of information, much of it apparently considered unsuitable for publication, and made long series of experiments, many of them, judging from the report, more easily made than their results explained.

Finally, after four years' work, they have issued a report with the satisfactory feature that practically no change is recommended to be made in the mode of management of the permanent way by the railway companies.

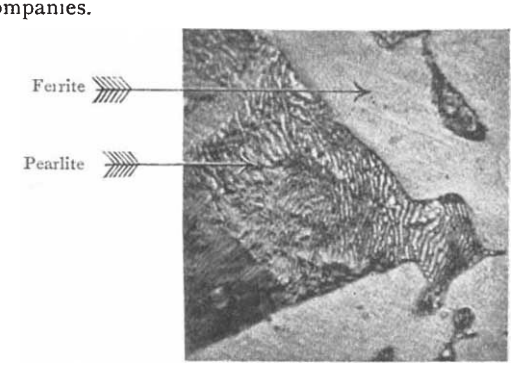

FIG. 1.—Steel rail. × 850 D. Showing pearlite and ferrite.

Nevertheless, although no legislation seems likely to result from the labours of the committee, the evidence that has been collected and published in the appendices to the report is of great scientific interest. The experimental work that was undertaken was divided among the members of the committee. A number of rails found broken on the road, or discarded as worn out, were selected for examination. Prof. Unwin took charge of the tests on their hardness, tensile strength and bending strain, and Mr. Windsor Richards of those on their resistance to the shock of falling weights; Sir William Roberts-Austen made micrographical examination of the rails, and Dr. Thorpe analysed them. Sir Lothian Bell includes in his comprehensive memorandum details of a number of mechanical tests on rails, and Prof. Dunstan gives an interesting account of the effects of atmospheric corrosion.

Interest naturally centred around the St. Neots rail. It was found to be of ordinary composition, and the mechanical tests applied to it showed that the steel was of variable, but, on the whole, of good quality. It was only on microscopic examination that the extraordinary character of the rail became evident. Good rail steel, according to Sir W. Roberts-Austen, consists of "ferrite," or iron free from carbon, and "pearlite," which is a mixture of alternate bands of ferrite and "cementite" (the carbide corresponding to the formula Fe_3C). The structure is shown in Fig. 1, a reproduction of a micro-